

## CLAIMS

What is claimed is:

1. A method for receiving a plurality of communications transmitted in a wireless code division multiple access format, a channel response for each received communication is estimated, a system responsive matrix is constructed using codes and the channel responses of the received communications, an objective matrix is produced using the system response matrix, the received communications being matched filtered to produce a first input, the method comprising:

a. processing the first input with an interference cancellation matrix to produce a first set of symbols of the received communications;

b. processing the first set of produced symbols with a feedback interference construction matrix to produce feedback interference, the feedback matrix added to an inverse of the interference cancellation matrix equaling the objective matrix;

c. subtracting the feedback interference from a result of the matched filtering to produce a next input; and

d. processing the next input with the interference cancellation matrix to a next set of produced symbols of the received communications.

2. The method of claim 1 comprising iteratively repeating steps (b), (c) and (d) with the next set of produced symbols acting as the first set of produced symbols.

3. The method of claim 1 wherein the interference cancellation matrix being a diagonal of the objective matrix.

4. The method of claim 1 wherein the objective matrix is  $A^H A$ , where  $A$  is the system response matrix.

5. The method of claim 1 wherein the objective matrix is  $A^H A + \sigma^2 I$ , where  $A$  is the system response matrix,  $\sigma^2$  is a noise variance and  $I$  is an identity matrix.

6. The method of claim 1 wherein the match filtering multiplies the received signals by a complex conjugate transpose of the system response matrix.

7. A receiver receives a plurality of communications, the communications are transmitted in a wireless code division multiple access format, a channel estimator estimates a channel response for each received communication, a system response matrix is constructed using codes and channel responses of the received communications, an objective matrix is produced using the system response matrix, a matched filter match filters the received communications, the receiver comprising:

a direct interference cancellor having an input configured to receive an output of the matched filter and an output of a subtractor and processing its input with an interference cancellation matrix;

a feedback interference computation block for processing an output of the direct interference cancellor with a feedback construction matrix, the feedback matrix added to an inverse of the interference cancellation matrix equaling the objective matrix; and

the subtractor for subtracting an output of the feedback interference computation block from an output of the matched filter.

8. The receiver of claim 7 wherein the output of the direct interference cancellor produces soft symbols of the received communications.

9. The receiver of claim 8 comprising a hard-decision symbol generation unit receiving the output of the direct interference cancellor and inputting hard symbols into the feedback interference computation block.

10. The receiver of claim 7 wherein the interference cancellation matrix being a diagonal of the objective matrix.

11. The receiver of claim 7 wherein the objective matrix is  $A^H A$ , where  $A$  is the system response matrix.

12. The receiver of claim 7 wherein the objective matrix is  $A^H A + \sigma^2 I$ , where  $A$  is the system response matrix,  $\sigma^2$  is a noise variance and  $I$  is an identity matrix.